



# Solar-Powered Boat Prototype

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## TOOLS:

- [Multimeter or Continuity Tester \(1\)](#)
- [Soldering Iron and rosin core solder. \(1\)](#)
- [Wire stripper/crimper \(1\)](#)
- [X-Acto knife \(1\)](#)



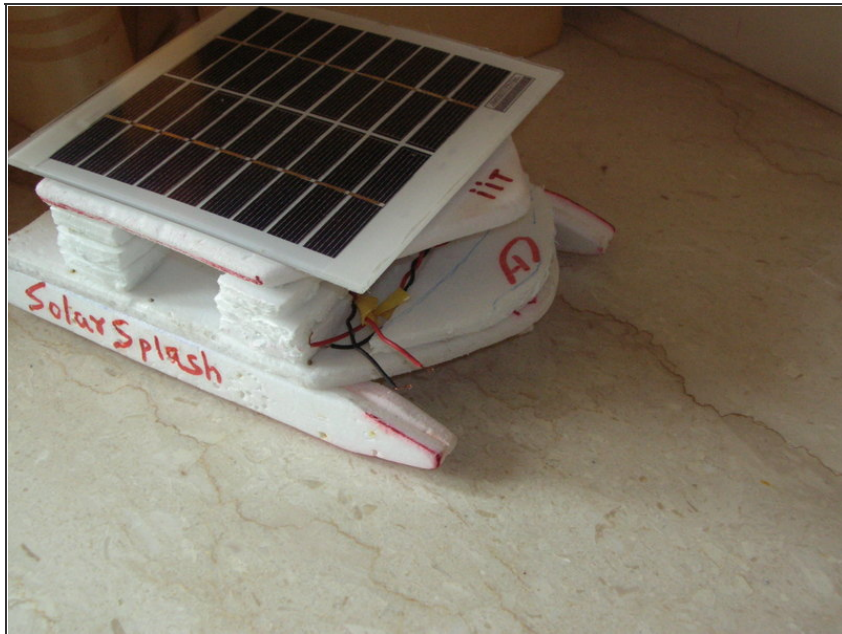
## PARTS:

- [Styrofoam sheet \(thermocol\) \(1\)](#)
- [Fabric/craft glue \(1\)](#)
- [paper pins \(1\)](#)
- [Wire \(1\)](#)
- [8-10V monocrystalline solar panel \(1\)](#)
- [6v DC motor \(600 rpm\) \(1\)](#)

## SUMMARY

I built this project when I was in the 6th grade, for a competition at the IIT Techfest in Jan. 2010. The IIT Techfest is a competition for engineering students. However, my love towards making this brought me into making this project guide. I am now in the 8th grade! We have not given you the measurements of the parts so that you may go and design your own boat and its parts. We have only given you info on how to assemble the entire boat.

## Step 1 — Why are we not giving you measurements?



- You might be getting angry and wanting to leave this page, but there is a reason behind us not giving the measurements.
- You must design your own boat and its parts. Your boat should be of the size you want it to be.
- The reason we are making a small model of the boat is so that the problems we face while making the prototype are not made when making the actual full-size model.
- In this tutorial, we are just giving you instructions on how to assemble the parts and some info on cutting the parts, but not the measurements.

## Step 2 — Make your boat's body first



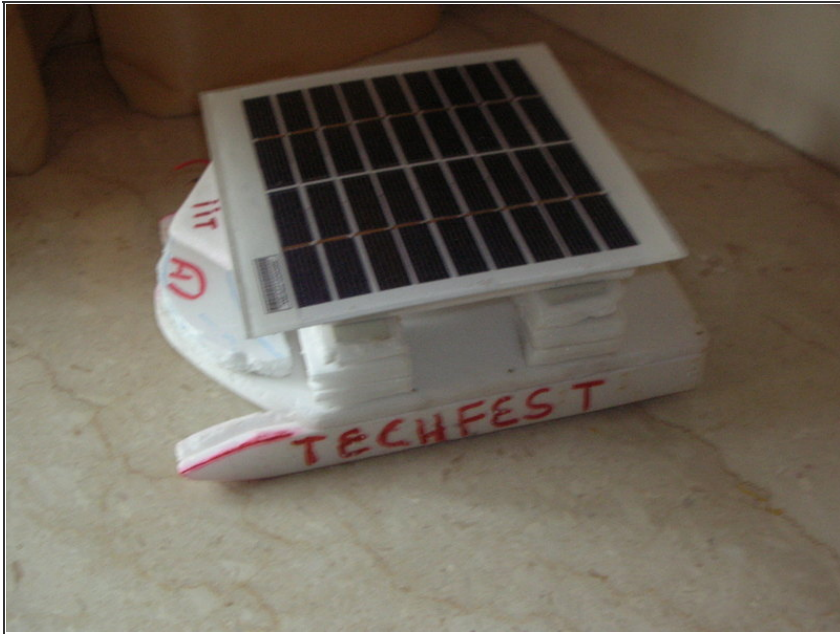
- Cut your high-density thermocol (styrofoam) according to the size of the parts and the number of parts.
- The 4 fins for the base of the boat should be equal in size. However, the 5th fin should be half the length of the other 4 fins.
- Double up the 4 fins into pairs such that you get a pair of fins and 1 fin which is half the size of those.
- These are your main 2 fins (doubled) for your boat.
- Cut out the base for your boat. Make the length of the base equal to the lengths of your fins.
- Make 2 of these bases and 1 more piece which is the size of your base.
- Cut 12 small square pieces of the styrofoam.

### Step 3 — Now let's assemble the body!



- Double up 2 of those bases and keep 1 base separate.
- Add the pair of fins you have to the bottom of the base, one on each side. Add your extra single fin on the bottom as well, centered between the pair of fins. Place this smaller fin toward the front and not towards the rear of the boat.

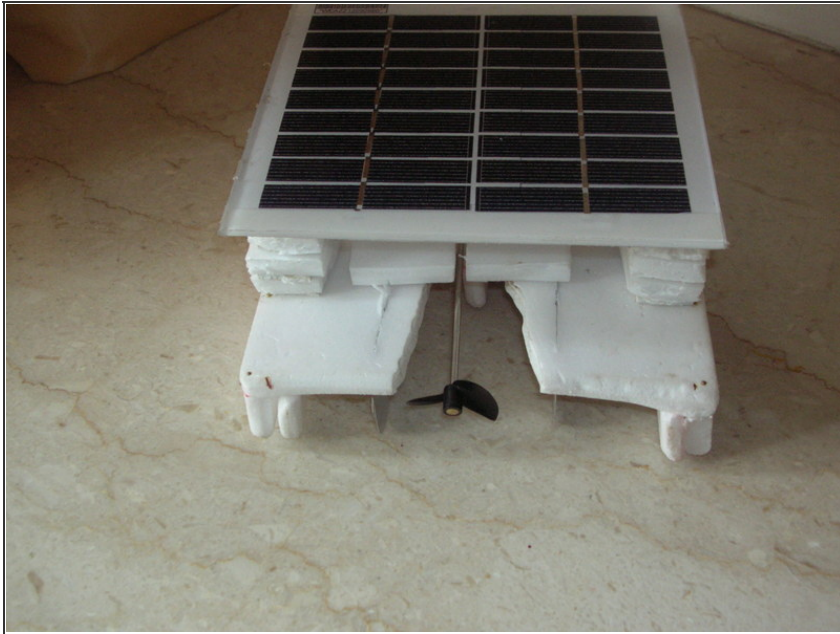
## Step 4 — Let's make the stand for our solar panel



- Make 4 stands of squares using the 12 square pieces we cut, grouping them in groups of 3. Hence,  $3 \times 4 = 12$ .
- Place these 4 pillars towards the corners of the boat on the top side and stick them there using some double-sided tape or even normal craft glue.
- Now stick the extra piece of styrofoam we cut to our base on top of those four pillars so that it acts as a roof!
- Cut a gap in the roof for the wires from the solar panel to come to the motor.
- Using a multimeter, check the polarity of the solar panel by placing it in the sun and measuring the voltage produced. Be careful. It is advisable to use a diode so that the current doesn't flow back into the panel. Stick the base of the panel on the roof using some double-sided tape and pass the wires through the gap you cut.



## Step 5 — Let's make the drive assembly



- Solder the wires coming from the solar panel to a switch and then to the 6v DC motor we are using.
- Attach the drive assembly to the motor and apply some hot glue to the shaft. Be careful that the glue doesn't get into the motor.
- Now screw your propeller onto the drive shaft.

## Step 6 — Let's put the drive shaft on the boat!



- Cut a "V" shape from the rear of the boat towards the place where you have stuck your motor, using a box-cutter knife or a hobby knife.
- Now, using small pieces of styrofoam, make a small platform for your motor so that it's raised to an angle and then cut an angle on the top of those pieces using your hobby knife.
- Stick those pieces on the top side of the base of the boat using some normal craft glue. Now screw in the motor there, using a "U" clip and screwing in the clip on the base.
- Now you will notice that your drive shaft also comes to an angle when you stick the motor on that tiny platform you built.
- The propeller on the shaft should be 50% in the water and 50% on top of the water for maximum acceleration.

## Step 7 — Time to test it out in the water



- Try out this boat in a shallow pond or in your bathtub first. See to it that the water doesn't enter into the base and reach the motor.
- If your boat isn't floating well and the water is entering, remove your fins and cut another piece of styrofoam equal to the size of the base and stick it to the bottom.
- If your boat floats, you can now focus on the acceleration.
- Make minor adjustments so that the propeller is 50% on top on the water and 50% in the water. 60% in the water and 40% on top would be best; however, get as close as you can.

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